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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 09/938,106
Filing Date: August 23, 2001
Appellant(s): DERDERIAN, JAMES M.

Brick G. Power
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed September 26, 2005 appealing from the Office action mailed June 21, 2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,400,007	Wu et al.	6-2002
6,388,313	Lee et al.	5-2002
6,531,784	Shim et al.	3-2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 23, 24, 29, 30, 33, 40, 45, 46, 49, 50, 53, 59 and 61-64 are rejected under 35

U.S.C. 102(e) as being anticipated by Wu et al. (US 6400007), hereafter Wu.

Regarding claims 23 and 45, Fig. 4 of Wu shows a device to use a method for assembling semiconductor devices with a densely stacked arrangement (col.2, line 64 through col. 3, line 61), comprising;

a first semiconductor device 28;
discrete conductive elements 32 over portions of said first semiconductor device and;
positioning a second semiconductor device 34 over the first semiconductor device, a back side of the second semiconductor device resting upon at least some of discrete conductive elements and being supported by being electrically isolated from each other (col.3, lines 54-56).

Regarding the limitation of “a back side of the second semiconductor device ... being supported thereby,” Fig. 5 of Wu shows that the discrete conductive elements (the wires) contributes to support the back side of the second semiconductor device with adhesive layers (50, 52) since the wires are in the direct contact beneath the back side of the second semiconductor device. In addition, Examiner would like to point out that the second (upper) semiconductor device is supported *collectively* by other elements under the second semiconductor device such as the wires and the adhesive layer through forming a complete package. Note that even the lower (first) semiconductor contributes a part of the collective support for the upper semiconductor device. That is, all elements connected directly or indirectly to one another is “collectively support one another.”

Regarding the limitation in the preamble of claim 45, Fig. 4 of Wu shows “semiconductor device in a stacked arrangement with stacked arrangement having a height substantially equal to combined thickness of each of the semiconductor device and distances discrete conductive elements associated therewith protrude above said each of the semiconductor devices.” In addition, note that the limitation in the preamble does not have patentable weight because it has been held that a preamble is denied the effect of a limitation where the claim is drawn to a structure and the portion of the claim following the preamble is a self-contained description of

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the structure not depending for completeness upon the introductory clause. *Kropa v. Robie*, 88 USPQ 478 (CCPA 1951).

Regarding claims 24 and 46, Wu discloses positioning the second semiconductor device comprises positioning the second semiconductor device on said at least some of discrete conductive elements with the back side and the discrete conductive elements in mutual electrical isolation (col.3, lines 54-56).

Regarding claims 29 and 49, Wu discloses a quantity of adhesive material 50 to at least an active surface of the first semiconductor device (col.3, lines 24-25).

Regarding claims 30 and 50, it is inherent that the device of Wu shows drawing the second semiconductor device toward the first semiconductor device after applying the adhesive on the first device since the adhesive is applied on the active surface of the first semiconductor device and positioning the second semiconductor device is followed.

Regarding claims 33 and 53, it is inherent that the applying is effected after the positioning the second semiconductor device since positioning the second semiconductor device has to be done before permanent adhering to the first semiconductor device.

Regarding claims 40 and 59, Wu discloses securing the first semiconductor device and a substrate to one another (col.3, lines 16-20).

Regarding claim 61, it is inherent that electrical communication would be established between bond pads of the second semiconductor device (34) and the corresponding contact areas of the substrate (col. 3, lines 41-43) in order to have the device operate functionally.

Regarding claim 62, Fig. 4 of Wu shows establishing communication comprises placing additional discrete conductive elements (56; wires) between each of the bond pads and the corresponding contact area of the corresponding contact areas.

Regarding claim 63, Fig. 4 of Wu shows providing at least one connective elements (42; signal output terminal) in communication with at least one bond pad of each of said first and second semiconductor devices (col. 3, lines 4-8).

Regarding claim 64, Wu discloses a method further comprising encapsulating (58 in Fig. 4; a packaging layer) said first and second semiconductor devices (col. 3, lines 44-47).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 25, 26, 31, 34, 35, 41-44, 47, 51, 54-58 and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable under obviousness over Wu in view of Lee et al. (US 6,388,313), hereafter Lee.

Regarding claims 25 and 47, Wu discloses the most aspect of the instant invention except “providing a dielectric coating on at least portion of said discrete conductive elements.” Lee discloses a method providing a dielectric coating on at least portion of said discrete conductive elements (col. 5, lines 40-44). It would have been obvious to one of ordinary skill in the art at

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the time of the invention to apply a coat on the discrete conductive elements (wires) of Wu's device with the teaching of Lee in order to prevent a short circuit between the semiconductor device and the bare wires.

Regarding claim 26, Lee shows a method wherein the providing comprises forming at least one of a dielectric oxide and a dielectric polymer coating on at least said portions of the discrete conductive elements (col. 5, lines 22-24).

Regarding claims 31 and 51, Wu does not disclose "said drawing is effected by at least one of capillary action of the adhesive material, curing of the adhesive material, application of heat to the adhesive material, and vibration of the adhesive material." However, it would be obvious that such drawing is effected by one of the effects recited by the pending claim since Wu's adhesive material (resin) is identical to the one recited in the instant invention. Furthermore, Lee discloses the drawing is effected by at least curing of the adhesive material (resin) and application of heat to the adhesive material (curing; col. 5, lines 32-40).

The limitations regarding claims 34 and 35 have been discussed in claims 30 and 31 with the combined teaching of Wu and Lee.

Regarding claim 41, Wu does not disclose "said placing the discrete conductive elements comprises securing the discrete conductive elements to contact areas of the substrate and the bond pads of the first semiconductor device." Lee shows a method wherein the placing the discrete conductive elements comprises securing the discrete conductive elements to contact areas of the substrate and the bond pads of the first semiconductor device (col. 5, lines 8-10). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Lee into the device of Wu in order to have signals transferred

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between the stacked devices through having the discrete conductive elements (wires) secured on the contact areas (bond pads) on the substrate.

Regarding claim 42, Lee shows the securing comprises electrically connecting bond pads of the second semiconductor device to the corresponding contacts areas of the substrate (col. 5, lines 13-16).

Regarding claim 43, Lee shows encapsulating at least portion of at least one of the substrate, the first semiconductor device, and the second semiconductor device (col. 6, lines 32-36).

Regarding claim 44, Lee shows forming external conductive elements 27 in Fig. 1 on the substrate in electrical communication with corresponding contact areas (col. 5, lines 1-4).

Limitations of claims 54 and 55 have been discussed in claims 34 and 35.

Regarding claim 56, Wu fails to disclose "biasing at least one of the first and second semiconductor devices toward the other of the first and second semiconductor devices." Lee shows biasing at least one of the first and second semiconductor devices toward the other of the first and second semiconductor devices (col. 4, lines 54-68). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Lee into the device of Wu in order to have an electrical connection for a necessary circuit configuration of the device.

Regarding claim 57, Lee shows controlling the biasing by controlling the amount of adhesive (col. 5, lines 41-43).

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Regarding claim 58, Lee shows the controlling the biasing comprises controlling the biasing force to a level sufficient to deform, kink, bend, or collapse the discrete conductive elements.

See the respective portions of the specification such as col. 5, lines 24-32.

Regarding claim 60, Wu fails to show “connecting the discrete conductive elements to corresponding contact areas of the substrate.” Lee shows connecting the discrete conductive elements to corresponding contact areas of the substrate (col. 5, lines 8-10). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Lee into the device of Wu in order to have current flow from supply contact areas of the substrate to the semiconductor devices through the discrete conductive elements (wires).

Claims 27, 32 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable under obviousness over Wu in view of Shim et al. (US 6,531,784), hereafter Shim.

Regarding claims 27 and 48, Wu does not disclose positioning a dielectric layer at least portions of the backside of the second semiconductor device. Fig. 7 of Shim shows the dielectric layer (50C) on the portion of the backside of the second semiconductor device. It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Shim into the device of Wu in order to enhance the electrical isolation between the devices and the wires.

Regarding claim 32, Wu does not disclose positioning a dielectric layer at least portions of the backside of the second semiconductor device. Fig. 3 of Shim shows the dielectric layer (44) on the portion of the backside of the second semiconductor device. It would have been

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obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Shim into the device of Wu in order to mount two devices securely.

(10) Response to Argument

A. REJECTIONS UNDER 35 U.S.C. § 102

On page 9 of the appeal brief, Appellant argues that “Neither independent claim 23 nor independent claim 45 requires that anything other than discrete conductive elements support a second semiconductor device.” The examiner respectfully disagrees. It is pointed out that the instant invention does not recite that the discrete elements are the sole elements supporting the second semiconductor device. Claim 23 recites “positioning a second semiconductor device at least partially over [a] first semiconductor device, a back side of the second semiconductor device *resting upon at least some of* the discrete conductive elements and *being supported thereby ...*” (emphasis added). And claim 45 recites “positioning a second semiconductor device at least partially over [a] first semiconductor device and on at least some discrete conductive elements ... such that *the second semiconductor device is supported by the at least some discrete conductive elements ...*” (emphasis added). These limitations do not imply that the second semiconductor device is supported solely by discrete conductive elements. In fact, the claim recitation of “a back side of the second semiconductor device resting upon at least some of the discrete conductive elements” indicates that the second semiconductor device can rest upon other elements including the discrete conductive elements. With the same claim interpretation applied, the claim recitation of “the second semiconductor device is supported by the at least some discrete conductive elements”

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indicates that the second semiconductor device can be supported by other components including the discrete conductive elements. Furthermore, the elected embodiment in Figures 12-17 of the instant invention does not show that the discrete conductive elements are the only components to support the second semiconductor device. Rather, Figures show that substantially the entire back surface of the second semiconductor device, that is, the second semiconductor device is supported mainly by the adhesive 39'. Additionally it is pointed out that the instant invention discloses that "[t]he second semiconductor device is positioned over the first semiconductor device, resting on and supported *collectively* by the discrete conductive elements" This disclosure clearly indicates that the discrete elements are not the sole elements that contribute the support for the second semiconductor device. Therefore, FIG. 5 of Wu shows all the limitations recited in the claims 23 and 45.

On page 9, Appellant argues that "FIG. 5 of Wu does not clearly depict any of the features located between the first semiconductor die 28 and the second semiconductor die 34." Examiner respectfully disagrees. An enlarged figure of FIG. 5 on the front page of the Wu reference shows that several elements, in particular, discrete elements, wires 32 are in contact with the second semiconductor device 34, therefore clearly indicating that the wires support the weight of the second semiconductor device.

On page 10, Appellant further argues that "As the specification of Wu provides no further detail, and the delicate wires 32 do not necessarily support the second semiconductor die 34, Wu does not expressly or inherently describe that the 'a back side of the second semiconductor [die 34] rest[s] upon at least some of the [wires 32]' or that 'the second semiconductor [die 34] is supported by . . . at least some discrete conductive elements.'"

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Examiner respectfully disagrees with the remark since Wu specifically discloses the structural relationship between the discrete conductive elements (wires) and the second semiconductor device. In column 3, lines 50-57, Wu discloses that the discrete conductive elements (wires) are pressed by the second semiconductor device (the upper semiconductor device). Since the wires are not bent or deformed by the pressure from the weight of the second semiconductor device, this disclosure indicates that the wires are in an inert state of being pressed by the second semiconductor device. Therefore, the second semiconductor device rests upon the discrete conductive elements (wires). And the second semiconductor device is supported by wires since there is no collapse of the wires from the pressure caused by the weight of the second semiconductor device, which would result in malfunctioning of the entire device.

On page 10, Appellant argues that “Claim 24 is further allowable because Wu lacks any express or inherent description of positioning a second semiconductor die 34 over wires 32 with a back side of the semiconductor die 34 and wires 32 ‘in mutual electrical isolation’.” Examiner disagrees. It is pointed that Wu explicitly discloses that the wires are pressed by the second semiconductor die 34 (upper semiconductor device) indicating that there is a contact between them. Therefore, it is inherent that the second semiconductor die (upper semiconductor device) is electrically isolated from the wire. Otherwise, the second semiconductor die would be short circuited resulting in malfunctioning of the entire device.

On page 10, Appellant argues that “[c]laim 30 is additionally allowable since Wu does not expressly or inherently describe ‘drawing’ second semiconductor die 34 thereof toward first semiconductor die 28.” It is pointed out that “drawing” in general means an action of

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bringing an object to a certain direction. It is inherent the second semiconductor die 34 has to be drawn to the first semiconductor die 28 since the first semiconductor die 28 is in advance secured to the substrate 26. Appellant further argues that “[r]esins and other adhesive materials do not necessarily shrink when cured. . . . Wu is silent as to whether adhered glue 50 is in a cured or uncured state when second semiconductor die 34 is positioned over adhesive glue 50.” The instant invention, however, does not recite this aspect to define the meaning of “drawing.”

On page 11, Appellant argues that “[c]laim 33 is also allowable since Wu includes no express or inherent description that a quantity of adhesive material (adhered glue 50 or element 54) is applied to an active surface of first semiconductor die 28 ‘after . . . positioning the second semiconductor’ die 34 thereover.” The instant invention, however, does not recite a limitation reflecting this aspect.

On page 11, Appellant argues that “[c]laim 50 is additionally allowable since Wu does not expressly or inherently describe ‘drawing’ second semiconductor die 34 thereof toward first semiconductor die 28.” The argument is substantially identical in nature to the one regarding claim 30 and the rebuttal has been stated above.

On page 12, Appellant argues that “[c]laim 53 is also allowable since Wu includes no express or inherent description that a quantity of adhesive material (adhered glue 50 or element 54) is applied to an active surface of first semiconductor die 28 ‘after . . . positioning the second semiconductor’ die 34 thereover.” The argument is substantially identical in nature to the one regarding claim 30 and the rebuttal has been stated above.

B. REJECTIONS UNDER 35 U.S.C. § 103(a)a. WU IN VIEW OF LEEi. NO MOTIVATION TO COMBINE

In response to Appellant's argument on page 14 that there is no suggestion to combine the references, the examiner recognizes that references cannot be arbitrarily combined and that there must be some reason why one skilled in the art would be motivated to make the proposed combination of primary and secondary references. *In re Nomiya*, 189 USPQ 607 (CCPA 1975). However, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is what the combination of disclosures taken as a whole would suggest to one of ordinary skill in the art. *In re McLaughlin*, 170 USPQ 209 (CCPA 1971). References are evaluated by what they suggest to one versed in the art, rather than by their specific disclosures. *In re Bozek*, 163 USPQ 595 (CCPA) 1969. Appellant further argues that "neither Wu nor Lee teaches or suggests that a back side of an upper semiconductor device may be supported by bond wires or other intermediate conductive elements extending over the active surface of a lower, adjacent semiconductor device." However, as discussed in length above, FIG. 5 of Wu clearly shows that an upper semiconductor device 34 is supported by bond wires 32 that extend over the active surface of a lower, adjacent semiconductor device 28.

ii. NO EXPECTATION OF SUCCESS

In response to Appellant's argument on page 14 that "one of ordinary skill in the art would have had no reason to expect the asserted combination of teachings *from* Wu and Lee to be successful." The examiner disagrees. It is shown that the Wu's disclosure meets all the limitation recited in the independent claims 23 and 45, and Lee whose device bears the structural resemblance to the Wu's device is further referred merely to address the limitations for the properties exhibited during the application of the adhesive. Therefore, one of ordinary skill in the art would expect the combination of teachings from Wu and Lee to be successful.

iii. THE REFERENCES DO NOT TEACH OR SUGGEST EACH AND EVERY ELEMENT OF SEVERAL CLAIMS

Appellant argues on page 15 that "[c]laim 31 is allowable since Wu and Lee both lack any teaching or suggestion that the adhesive materials or resins disclosed therein are capable of drawing two semiconductor devices toward one another 'by at least one of capillary action ..., curing ..., application of heat ... , and vibration.' " It is pointed out that Wu's adhesive material (resin) is identical to the one disclosed in the instant invention, therefore, Wu's adhesive is capable of drawing two semiconductor devices toward one another "by at least one of capillary action ..., curing ..., application of heat ... , and vibration." Furthermore, Lee discloses the application of the resin between two semiconductor devices, subsequently undergoing high temperature condition which is equivalent to curing (col. 5, lines 37-40).

Appellant argues on page 15 that "[c]laim 34 is allowable because neither Wu nor Lee teaches or semiconductor device may be drawn toward one another." The argument is substantially identical in nature to the one regarding claim 30 and the rebuttal has been

stated above.

Appellant argues on page 15 that “[c]laim 35, which depends from claim 34, is also allowable since Wu and Lee do not teach or suggest that curing of a glue, resin, or other adhesive material may cause two semiconductor devices to be drawn toward one another.” The argument is substantially identical in nature to the one regarding claim 30 and the rebuttal has been stated above.

Appellant further argues that “[c]laim 51 is allowable since both Wu and Lee lack any teaching or suggestion that the adhesive materials or resins disclosed therein are capable of drawing two semiconductor devices.” The argument is substantially identical in nature to the one regarding claim 30 and the rebuttal has been stated above.

Appellant argues on page 16 that “[c]laim 54 is allowable because neither Wu nor Lee teaches or suggests that two semiconductor device may be drawn toward one another.” The argument is substantially identical in nature to the one regarding claim 30 and the rebuttal has been stated above.

Appellant argues on page 16 that “[c]laim 55, which depends from claim 54, is also allowable since Wu and Lee do not teach or suggest that curing of a glue, resin, or other adhesive material may cause two semiconductor devices to be drawn toward one another.” The argument is substantially identical in nature to the one regarding claim 31 and the rebuttal has been stated above.

Appellant argues on page 16 that “[c]laim 57 is allowable because Wu and Lee both lack any teaching or suggestion of controlling biasing of one semiconductor device toward another.” It is pointed out that the instant invention discloses that two

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semiconductor devices are biased toward to one another when stacking the second semiconductor device on the first semiconductor device with an adhesive, therefore, biasing happens during the application of the adhesive to stack the semiconductor devices, and controlling biasing is accomplished through controlling the amount of the adhesive. Lee discloses this aspect in column 5, lines 31-45.

Appellant argues on page 16 that “[c]laim 58 is allowable since neither Wu nor Lee includes any teaching or suggestion of ‘controlling biasing force to a level insufficient to deform, kink, bend, or collapse . . . discrete conductive elements.’ ” Examiner disagrees. Lee discloses that the adhesive layer needs to be applied in a manner to prevent the wires from the damage during the die bonding process (column 5, lines 25-45). Furthermore, it is obvious and a common sense to one skilled in the art that a force attaching a second (upper) semiconductor device to a first (lower) semiconductor device should not be too strong to deform discrete conductive elements (wires), which would cause possible malfunctioning of the entire device.

b. WU IN VIEW OF SHIM

Rejections of claims 27 and 32 under 35 U.S.C. § 103(a) over Wu in view of Shim should be maintained for the reasons stated in claim 23.

Rejections of claim 48 under 35 U.S.C. § 103(a) over Wu in view of Shim should be maintained for the reasons stated in claim 45.

C. ELECTION OF SPECIES REQUIREMENT

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The resolution of this issue will be addressed once the Board makes a decision on the Appeal Brief.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.


Respectfully submitted,

jmi *lmz*
December 6, 2005

Conferees:

Drew A. Dunn SPE AU 2872 *877*

Eddie C. Lee SPE AU 2811


EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800
TECHNOLOGY CENTER 2800